



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,373	03/23/2005	Joachim Kiefer	3799.1009-000	3591
21005	7590	12/13/2006	EXAMINER	
HAMILTON, BROOK, SMITH & REYNOLDS, P.C.			BERNSHTEYN, MICHAEL	
530 VIRGINIA ROAD			ART UNIT	
P.O. BOX 9133			PAPER NUMBER	
CONCORD, MA 01742-9133			1713	

DATE MAILED: 12/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/523,373

Applicant(s)

KIEFER ET AL.

Examiner

Michael Bernshteyn

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25-51 is/are pending in the application.
- 4a) Of the above claim(s) 44-49 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 34 is/are allowed.
- 6) ☒ Claim(s) 25-33, 38-43 and 50 is/are rejected.
- 7) ☒ Claim(s) 32, 33, 35-37 and 51 is/are objected to.
- 8) ☒ Claim(s) 25-51 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 02/14/06, 05/18/06
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Applicant's election with traverse of Group I, claims 25-43 and 50-51 in the reply filed on September 18, 2006 is acknowledged. The traversal is on the ground(s) that according to PCT Rule, claims of different categories with common special technical features do not lack novelty. This is not found persuasive because the claimed common special technical feature in all claims is the proton-conducting polymer membrane comprising polymers containing sulfonic acid groups, and this common special technical feature lacks of novelty.

The requirement is still deemed proper and is therefore made FINAL.

2. This Office Action follows a responses filed on May 18, 2006 and September 18, 2006. Claims 25, 44, 48 and 50 have been amended; claim 51 has been added. Claims 44-49 have been withdrawn from the further consideration by the examiner, 37 CFR 1.142 (b), as being drawn to non-elected invention.

3. Applicants elected the following species:

- a) 3,3',4,4'-tetraaminobiphenyl for claims 25, 26 and 50;
- b) terephthalic acid for claims 25, 27 and 50;
- c) 1,3,5-benzenetricarboxylic acid (trimesic acid) for claims 25, 28, 29 and 50;
- d) heteroaromatic dicarboxylic acids for claims 25, 31 and 50;
- e) pyridine-2,5-di-carboxylic acid for claims 25, 32 and 50;
- f) R is a bond, Z is hydrogen, and A is hydrogen for claims 25, 34, 36 and 50.

Art Unit: 1713

g) tetraamino compounds is 3,3',4,4'-tetraaminobiphenyl; aromatic carboxylic acids is terephthalic acid; and vinyl-containing sulfonic acid is vinylsulfonic acid for claims 25, 44, 48 and 50.

4. Applicant's arguments, see remarks, filed on May 18, 2006, with respect to the rejection of claims 25-50 under 35 U.S.C. 102(e) and 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Sakaguchi et al. (U. S. Patent Application Publication 2004/0062969) and Gerber (U. S. Patent 3,783,137).

5. In view of the amendment and remarks the rejection of claims 25, 39, 44, 48 and 50 under 35 U.S.C. 112 2nd paragraph has been withdrawn.

6. Applicant's arguments, see remarks, filed on May 18, 2006, with respect to the rejection of claims 25, 44, 48 and 50 under 35 U.S.C. 112 1st paragraph have been fully considered and are not persuasive.

7. Claims 25-43 and 50-51 are active.

Claim Objections

8. Claim 32 is objected to because of the following informalities: claim recites twice the word "pyridine" in the 1st and 2nd lines. Appropriate correction is required.

9. Claim 33 is objected to because of the following informalities: claim recites acids without comma. Appropriate correction is required.

Art Unit: 1713

10. Claims 35-37 and 51 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The claims are dependable upon claim 25, which does not recite vinyl-containing phosphonic acid.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11. Claims 25, 38-40 and 50 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. It is not clear how practically to obtain the polymerization of the vinyl-containing sulfonic acid present in the sheetlike structure after step c) in claim 25 because after the mixture was heated under inert gas to temperatures of up to 350°C to form polyazole polymers, there is no more free vinyl-containing sulfonic acid in the mixture, which is capable for further polymerization. The specification does not show how practically produce step d) of the claimed process and does not contain any working examples for clarification.

Therefore, it appears that it would not enable one skilled in the art to which it pertain, or with which it is mostly connected, to make and/or use the invention.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claim Rejections - 35 USC § 103

12. The test of this section of Title 35 U.S.C. not included in this action can be found in a prior Office Action.

13. Claims 25-27, 33 and 41-43 are rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sakaguchi et al. (WO 02/038650). WO 02/038650 was published 05/16/2002 Gazette 2002/20 and is equivalent to the US Patent Application Publication 2004/0062969 and the EP 1 354 907 A1, therefore the following rejection is based upon the context of US 2004/0062969.

With regard to the limitation of instant claim 25, Sakaguchi discloses a polybenzazole compound having **sulfonic acid group** and/or phosphonic acid group useful as a solid **polymer electrolyte membrane**, a resin composition containing the

Art Unit: 1713

same, a resin molding, a solid polymer electrolyte membrane/electrode assembly and a **method of preparing the assembly** (page 1, [0001]). While the path for synthesizing such a compound is not particularly restricted, the compound can be synthesized by reaction between at least one compound selected from a group consisting of **aromatic tetramines**, aromatic diaminediols and aromatic diaminedithiols capable of forming imidazole rings, oxazole rings or thiazole rings in the compound and derivatives thereof and at least one compound selected from a group consisting of aromatic dicarboxylic acid and a derivative thereof in general (page 7, [0091]).

Sakaguchi discloses a method of synthesizing the polybenzazole compound having sulfonic acid group by employing at least one compound selected from the aforementioned group consisting of aromatic tetramine, aromatic diaminediol, aromatic diaminedithiol and derivatives thereof and at least one compound selected from the group consisting of aromatic dicarboxylic acid and a derivative thereof is not particularly restricted, but the compound can be synthesized by dehydration and cyclizing polymerization with a solvent of polyphosphoric acid (pages 9-10, [0110]).

Sakaguchi discloses that while an optimum reaction temperature for synthesizing the inventive polybenzazole compound is not unconditionally definable because the optimum reaction temperature depends on the combination of monomers, it may be impossible to control the content of sulfonic acid groups in the obtained polybenzazole compound the reaction is carried out at a high temperature as reported in literature and the reaction temperature is preferably lowered in the range capable of attaining the effects of the present invention in this case. Control of the content of sulfonic acid

groups in a polybenzazole compound may be possible by reducing the reaction temperature to some extent when the content of these groups is large (page 10, [0113]).

It is worth to mention that claim 25 is “**product-by-process**” claim. Therefore regarding the proton-conducting polymer membrane limitations in view of substantially identical monomers (sulfonic acid groups, aromatic tetraamino compounds, aromatic carboxylic acids, aromatic or heteroaromatic diaminocarboxylic acids, etc.), mixing the above monomers and heating the mixture under inert gas to high temperatures, applying a layer to support being used by both Sakaguchi and the applicant, it is the examiner position to believe that the product, i.e. proton-conducting polymer membrane of Sakaguchi is substantially the same as the proton-conducting polymer membrane recited in claim 25, even though obtained by a different process, consult *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Since the USPTO does not have proper equipment to do the analytical test, the burden is now shifted to the applicant to prove otherwise.

With regard to the limitation of instant claim 26, Sakaguchi discloses that While aromatic tetramine, aromatic diaminediol, aromatic diaminedithiol and derivatives thereof employable for synthesizing the inventive polybenzazole compound having sulfonic acid group and/or phosphonic acid group are not particularly restricted, 1,2,4,6-tetraaminobenzene, **3,3',4,4'-tetraaminodiphenyl ether**, 3,3',4,4'-tetraaminodiphenyl thioether, **3,3',4,4'-tetraaminodiphenylsulfone**, etc. (page 8, [0093]).

With regard to the limitation of instant claim 27, Sakaguchi discloses that it is possible to use general aromatic dicarboxylic acids reported for the preparation of

Art Unit: 1713

polyesters such as **terephthalic acid**, **isophthalic acid**, naphthalenedicarboxylic acid, diphenyl ether dicarboxylic acid, diphenylsulfonedicarboxylic acid, biphenyldicarboxylic acid, terphenyldicarboxylic acid or 2,2-bis(4-carboxyphenyl)hexafluoropropane, for example (page 16, [0175]).

With regard to the limitation of instant claim 33, Sakaguchi exemplifies 4,6-diaminoresorcinol dihydrochloride (Example 7, page 23, [0276]).

With regard to the limitation of instant claim 41, Sakaguchi discloses that in order to obtain polybenzazole compound, it is possible to use a method of synthesizing a precursor polymer having a polyamide structure or the like through reaction in a proper **organic solvent** or in the form of a mixed material monomer melt and converting the same to a target polyimidazole structure by subsequent cyclization through proper heat treatment or the like, for example (page 10, [0111]).

With regard to the limitation of instant claims 42 and 43, Sakaguchi discloses that the thickness of the cast solution (it is the claimed thickness of a layer) is not particularly restricted but is preferably at least 10 μm , and more preferably at least 100 μm . Further, this thickness is preferably not more than 1000 μm , and more preferably not more than 500 μm , which is within the claimed range (page 18, [0208]).

14. Claims 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi et al. in view of Gerber (U. S. Patent 3,783,137).

The disclosure of Sakaguchi's reference resided in § 13 is incorporated herein by reference.

With regard to the limitation of instant claims 28-29, Sakaguchi does not disclose the claimed aromatic tricarboxylic or tetracarboxylic acids and their derivatives.

With regard to the limitation of instant claims 31-32, Sakaguchi does not disclose the claimed heteroaromatic carboxylic acids, heteroaromatic dicarboxylic acids, heteroaromatic tricarboxylic acids, or heteroaromatic tetracarboxylic acids.

Gerber discloses a process for the preparation of soluble heterocyclic polymers which comprises the reaction of an acid derivatives of a di-, tri, or tetra-basic acid with an aromatic tetraamine acid salt in an aprotic polar solvent under mild reaction conditions, the acid derivative being added to the tetramine salt (abstract).

This type of polymer includes polybenzimidazole-type compositions (col. 2, lines 61-63). Gerber exemplifies the usage of **1,4,5,8-naphthalenetetracarboxylic acid**, **2,3,6-pyridinetricarboxylic acid** as specified in claim 29 (Example 30, col. 13, lines 54-55, col. 5, line 57, col. 6, line 55). Gerber also discloses that the mixtures of tricarboxylic acids may be used as acid derivatives, or mixtures of acids halides and acid anhydrides also may be used (col. 5, lines 60-63).

Gerber discloses that suitable diacid halides include those derives from the following acids, including **3,5-pyridinedicarboxylic acid**, **2,5-pyrazinedicarboxylic acid**, etc. as specified in claim 32.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the above mentioned 1,4,5,8-naphthalenetetracarboxylic acid, 2,3,6-pyridinetricarboxylic acid, 3,5-pyridinedicarboxylic acid, 2,5-pyrazinedicarboxylic acid, etc. as taught by Gerber in

Art Unit: 1713

Sakaguchi's polybenzazole compound having sulfonic acid group and/or phosphonic acid group useful as a solid polymer electrolyte membrane with reasonable expectation of success, and thus to arrive the subject matter of claims 28-29 and 31-32.

It is noted that "The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945)". "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig-saw puzzle." 325 U.S. at 335, 65 USPQ at 301.). See MPEP 2144.07.

With regard to the limitation of instant claim 30, the combined teaching of Sakaguchi and Gerber does not disclose the amount of tricarboxylic acid or tetracarboxylic acids based on dicarboxylic acid used.

It is noted that the amount of tricarboxylic acid or tetracarboxylic acids based on dicarboxylic acid used is a result effective variable, and therefore, it is within the skill of those skilled in the art to find the optimum value of a result effective variable, as per *In re Boesch and Slaney* 205 USPQ 215 (CCPA 1980): Discovery of optimum value of a result effective variable in known process is ordinarily within the skill in the art and would have been obvious.

Allowable Subject Matter

15. Claim 34 would be allowable if rewritten in independent form and to include all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: the present claims are allowable over the closest reference: Sakaguchi et al. (U. S. Patent Application Publication 2004/0062969).

Sakaguchi discloses a polybenzazole compound having sulfonic acid group and/or phosphonic acid group useful as a solid polymer electrolyte membrane, a resin composition containing the same, a resin molding, a solid polymer electrolyte membrane/electrode assembly and a method of preparing the assembly (page 1, [0001]).

However, Sakaguchi et al. does not disclose or fairly suggest the usage in step a) of vinyl-containing sulphonic acid compounds of the claimed formulas for producing instantly claimed proton-conducting polymer membrane.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Bernshteyn whose telephone number is 571-272-2411. The examiner can normally be reached on M-F 8-5:30.


Art Unit: 1713

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael Bernshteyn
Patent Examiner
Art Unit 1713

MB
12/06/2006


DAVID W. WU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700